Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US2006/014906

International filing date: 20 April 2006 (20.04.2006)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/762,329
Filing date: 26 January 2006 (26.01.2006)

Date of receipt at the International Bureau: 13 June 2006 (13.06.2006)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1475626

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

June 05, 2006

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: *60/762,329*
FILING DATE: *January 26, 2006*
RELATED PCT APPLICATION NUMBER: *PCT/US06/14906*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US60/762,329*

Certified by

Jon W. Dudas

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

EV615054085US

PTO/SB/16 (10-05)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 2

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EV 615054085

U.S. PTO 20427 012606

U.S. PTO 112900 60/762329 012606

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Roderick, M.	Dayton	Strongsville, Ohio 44136

Additional inventors are being named on the _____ *separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max):

PNEUMATIC AIR DAM SYSTEM - "PADS"

Express Mail Label No. EV 615054085 US
I hereby certify that this paper is being deposited today with the U.S. Postal Service as Express Mail addressed to the Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450
on January 26, 2006
By: Jennifer Nock Hinton

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

☐ The address corresponding to Customer Number:

OR

☑ Firm or Individual Name Jennifer Nock Hinton

Address: Watts Hoffmann Co., L.P.A. 1100 Superior Avenue, Suite 1750,

City	State	Zip
Cleveland	Ohio	44114-2518
Country USA	Telephone (216) 241-6700	Email jhinton@wattshoff.com

ENCLOSED APPLICATION PARTS *(check all that apply)*

☐ Application Data Sheet. See 37 CFR 1.76

☑ Specification *Number of Pages* 4

☑ Drawing(s) *Number of Sheets* 5

☐ CD(s), Number of CDs _____

☐ Other (specify) _____

Fees Due: Filing Fee of $200 ($100 for small entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT

☑ Applicant claims small entity status. See 37 CFR 1.27.

☑ A check or money order is enclosed to cover the filing fee and application size fee (if applicable).

☐ Payment by credit card. Form PTO-2038 is attached

☑ The Director is hereby authorized to charge the filing fee and application size fee (if applicable) or credit any overpayment to Deposit Account Number: 23-0630. A duplicative copy of this form is enclosed for fee processing.

$100.00

TOTAL FEE AMOUNT ($)

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

PROVISIONAL APPLICATION COVER SHEET
Page 2 of 2

PTO/SB/16 (10-05)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☑ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

SIGNATURE _____ Date 26JAN06

TYPED or PRINTED NAME Jennifer Nock Hinton REGISTRATION NO. 47,653 *(if appropriate)*

TELEPHONE (216) 241-6700 Docket Number: 16-812

Pneumatic Air Dam System – "PADS"

The Pneumatic Air Dam System, herein referred to as "PADS", is a device intended to reduce aerodynamic drag through altering the path of airflow under and/or immediately around a vehicle. The device may be designed into future production vehicles or added to an existing vehicle as a retrofit device. While targeted to the "over the road" Class 8 truck market, the device is equally applicable to virtually all modes of ground transportation. The principle effect of the device is to reduce drag and generate a corresponding increase in fuel efficiency.

The "PADS" consists of multiple individually inflated structures in various geometric forms having cross sectional shapes such as circles, ovals, rectangles, and trapezoids and a height of sufficient length. These structures are herein referred to as "Cells", and for example purposes, consider circular cross section Cells of approximate four inches diameter by nine inches tall. When placing multiple Cells together with each Cell's long edge abutted to the next Cell's long edge, they form a continuous barrier. Figure 1 provides an overall view of the cells installed on a class 8 truck. Figures 2 and 3 display a side and bottom views with cells aligned in a typical orientation. Figures 4 and 5 show a single cell inflated and deflated and define the typical structure of the cell.

Each Cell consists of a combination of materials such as an internal inflatable bladder (see figures 4 and 5, material marked A) inserted into a flexible impact resistant sheath (see figures 4 and 5, material marked B). When the bladder is pressurized with high pressure air, the Cell becomes effectively rigid to the extent that the Cell will not deflect under the pressure of air moving at velocities typically encountered in a vehicle traveling on a paved surface, yet significant impact can cause the Cell to deflect, such as when the Cell makes contact with debris on the paved surface over which the vehicle is traveling. In such an impact situation, the Cell, upon removal of the deflecting force, returns to its pre-deflected state and position. When the "PADS" is not activated, the deflated cells are lifted up toward the undercarriage of the truck such that the deflated cell is removed from general sight and impact. A spring steel wire is contained in the sleeve (see figures 4 and 5, material marked C) to provide a retracting force to lift the deflated cell when the "PADS" is not activated. The spring steel lifting force is overcome when the system is active.

In practice, the Cells are suspended from the underside of a vehicle carriage such that, for example, the four inch diameter sections are attached to the undercarriage and the nine inch lengths extend down toward the ground. Figures 1, 2, and 3 display side and bottom views of a class 8 truck with cells aligned in a typical orientation. When aligned in this manner, the Cells form a barrier blocking the primary flow of air under and/or immediately around the vehicle. Figure 2 shows a side view of the cells installed on a vehicle with letter A indicating the cells positioned along the front of the vehicle, B indicating cells located under the carriage, and C indicating the air gap filled by the cells when inflated. Figure 3 shows the typical spatial placement left to right and the resultant air path blockage created by the inflation of the cells. Blocking the primary flow of air under the vehicle causes a reduction in the drag created by air turbulence under the carriage of the vehicle and has the resultant effect of improving fuel efficiency.

Specific unique attributes: The "PADS" structure is unique compared to other devices used to create a similar effect in the following ways: The method of pneumatic actuation is unique. The method of providing impact resistance is unique. The location and shape of the installation on the vehicle, herein referred to as the "Air Bullet", between the front and rear axles as Shown in figures 2 and 3 and marked as B, as well as the combination of this dam and the dam located at the front of the vehicle, marked A in figures 2 and 3 is unique. Another unique aspect is that the "PADS" Cells may be placed around the perimeter of the entire vehicle and may also be incorporated on the trailer.

While the concept of air dams is not new, this system is unique in the method of creating the air dam. Further, the system is actuated such that it is capable of being turned on and off and moved in and out of position while the vehicle is in motion, it is impact resistant such that impacts are absorbed and the Cells reset themselves to optimal position, and the system may be used around the entire periphery, in selected peripheral areas, and/or located on the undercarriage of the vehicle not only along the front of the vehicle where other fixed air dams have none of these advantages. When placed in the undercarriage "Air Bullet" position, typical view shown in Figure 1, the "PADS" has the additional benefit of being less visually intrusive to the design of the vehicle.

Figure 3 shows the typical "PADS" locations. The "PADS" can be positioned at location A, location B, locations A and B, and around the entire periphery of the vehicle, and any combination or subsections of these locations with varying levels of air flow restriction. The "PADS" may also be located around the front of a trailer, around the entire trailer, and any combination or subsections of these locations, again, with varying levels of air flow restriction.

Figure 4 shows an inflated cell and its basic components: the impact resistant sleeve; the inflatable bladder, which resides within, and is restrained by, the sleeve; and the spring steel wire. Figure 5 shows a deflated cell in its home, curled upward, position. The upward curl is caused by the spring steel wire, which in its natural state is bent into a "U" shape. Figure 4 and 5 show side views of a cell. The sleeve (figures 4 and 5, material marked B) has additional lengths of material in the front and back of the cell. The extra sleeve material is permanently sandwiched between two malleable strips, typically formed of metal, in the front and back of the cell diameter, 180 degrees apart. The malleable strip has mounting tabs (see figures 4 and 5, material marked D) where the malleable strip is to be mounted to the carriage of the vehicle. Each malleable strip consists of multiple cells mounted side by side, the number of cells being determined by the spatial coverage required.

The cells are made rigid pneumatically. Utilizing high pressure, low volume air, cells are interconnected by small diameter pneumatic tubing (see figures 4 and 5, material marked E). Typically, no more than four cells will be interconnected minimizing the potential for complete loss of air pressure should one cell malfunction. The Malleable strips are designed to be modular such that strips may be replaced as needed or placed individually for location optimization.

Figures 6-9 illustrate an alternative embodiment of the pneumatic air dam system. Each cell G is made up of an impact resistant sleeve H that surrounds an inflatable bladder I. The spring steel

wire C, or alternatively an expandable joint, which in its natural state has a "U" shape is inserted into the sleeve H. The spring C causes the cell to curl upward when the bladder is not inflated as shown in Figure 7. Each cell is pressed onto a nipple J that is part of a supporting rail P or rails (Figures 8-10) that is mounted to the underside of the truck in locations in which the air dam system is to be installed. Each rail holds multiple cells mounted side by side, the number of cells being determined by the spatial coverage required. The cells are pushed onto the nipple and locked into position by barbs or other friction enhancing features on the nipple and may also be connected using one or more external clamps or ties (not shown). The cells are made rigid pneumatically. Cells are inflated by pumping air through passages K in the nipple.

Referring now to Figure 9 a cross section of a portion of a rail is shown. A number of non-intersecting interior air passages such as those labeled R and Q are made in the rail. Each passage supplies air to a finite number of cells, such as ten cells. The passages are independent from each other to minimize the potential for complete loss of air pressure should one cell malfunction. The rails are designed to be modular such that they may be placed individually for location optimization. Each rail and its interior air passages are in communication with a pressurized air supply R. Figure 9 shows the passageways arranged vertically, in another embodiment shown in Figure 10, there are four interior passageways, W,X,Y,Z equidistantly aligned side to side of the rail P'. None of the passageways is located along the centerline of the rail, as this is where the nipples are mounted to the rail. Each of the four passageways begins where the rail is closest to the air supply such as at the front of the bullet shape as shown in Figure 9. The passageways W,X,Y,Z have varying lengths and have holes that serve as an air conduit to a nipple. The holes start at the termination end of each rail. Each passageway has conduits for supplying ten nipples as shown in Figure 10.

Claims
I claim:

1. For use with a land vehicle, an air dam comprising:

a plurality of flexible cells disposed along a portion of an underside of the vehicle which can assume a stowed position and a deployed position; wherein when the cells are in the deployed position they project from the underside of the vehicle to form an air deflecting air dam;

an actuator that selectively actuates the plurality of cells between the stowed position and deployed position.

2. The air dam of claim 1 wherein each flexible cell includes a generally cylindrical inflatable bladder that assumes the deployed position when inflated and wherein the actuator is a pressurized air supply and one or more air passageways that route air to the inflatable bladder to inflate the bladder to the deployed position.

3. The air dam of claim 1 wherein each flexible cell includes a steel wire spring that biases the cell to the stowed position in which the flexible cell curls up away from the surface on which the vehicle travels.

4. The air dam of claim 1 wherein the actuator moves the cells to the deployed position based on vehicle speed.

5. The air dam of claim 2 wherein the cell includes an outer impact resistant sleeve that surrounds the inflatable bladder.

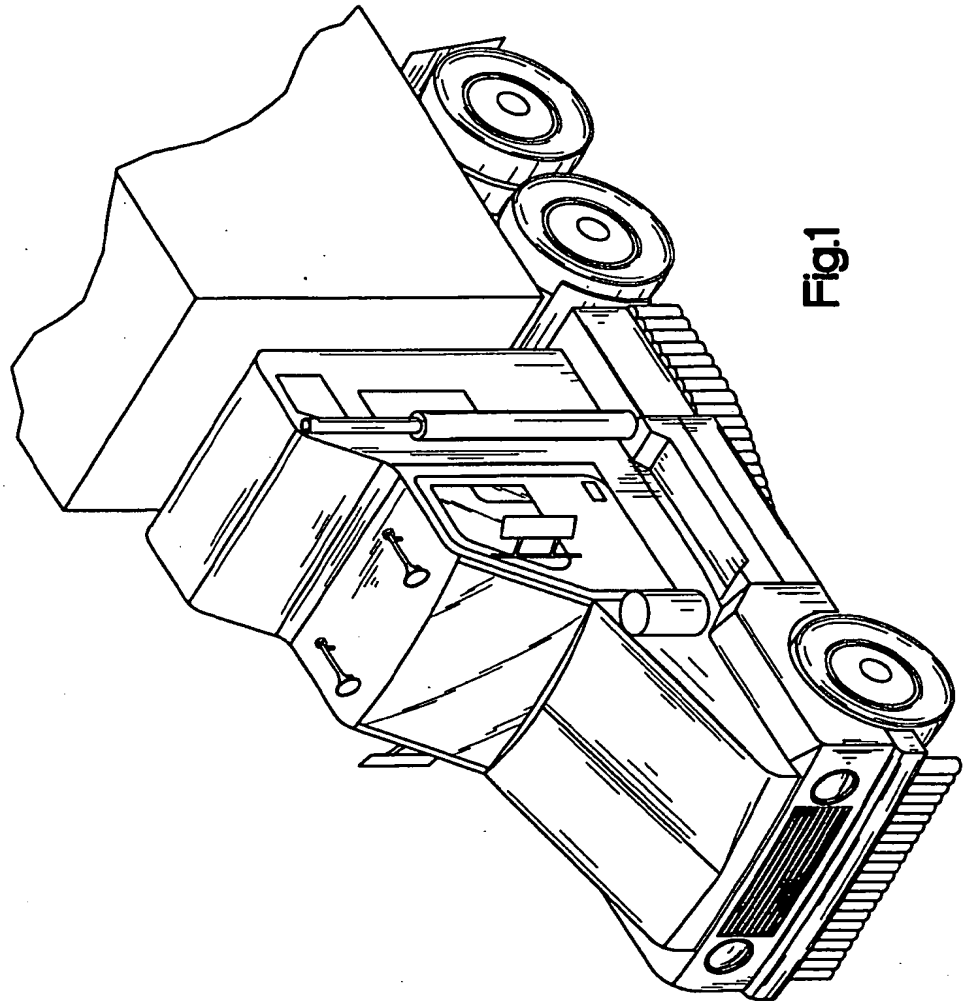

Fig.1

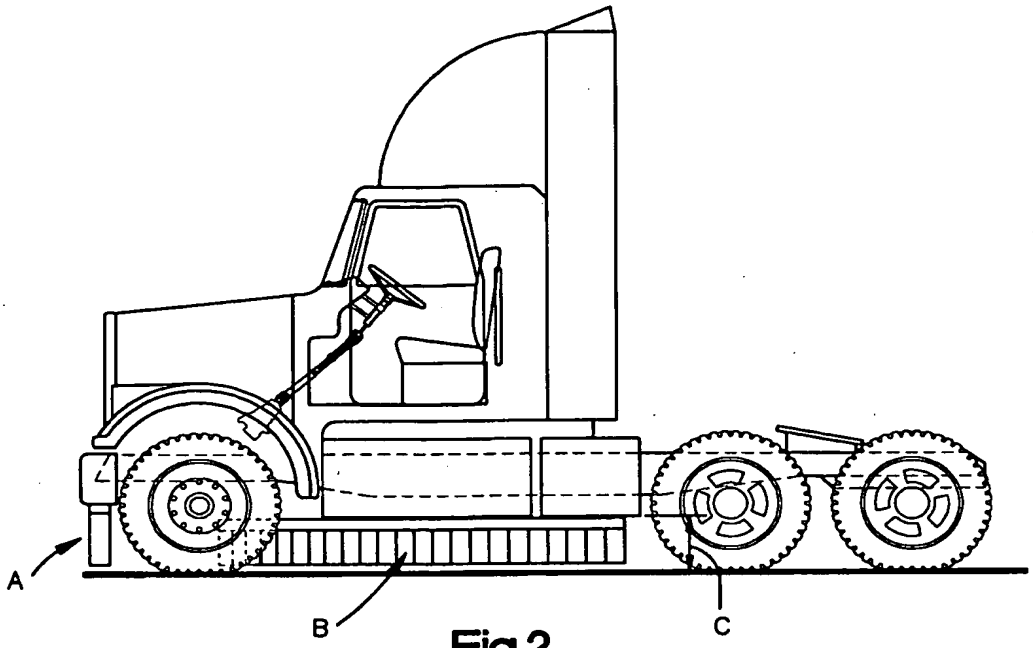

Fig.2

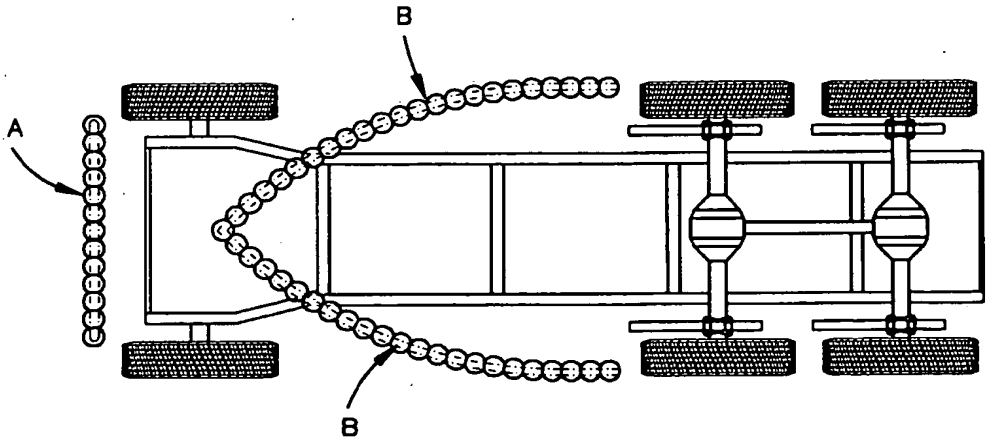

Fig.3

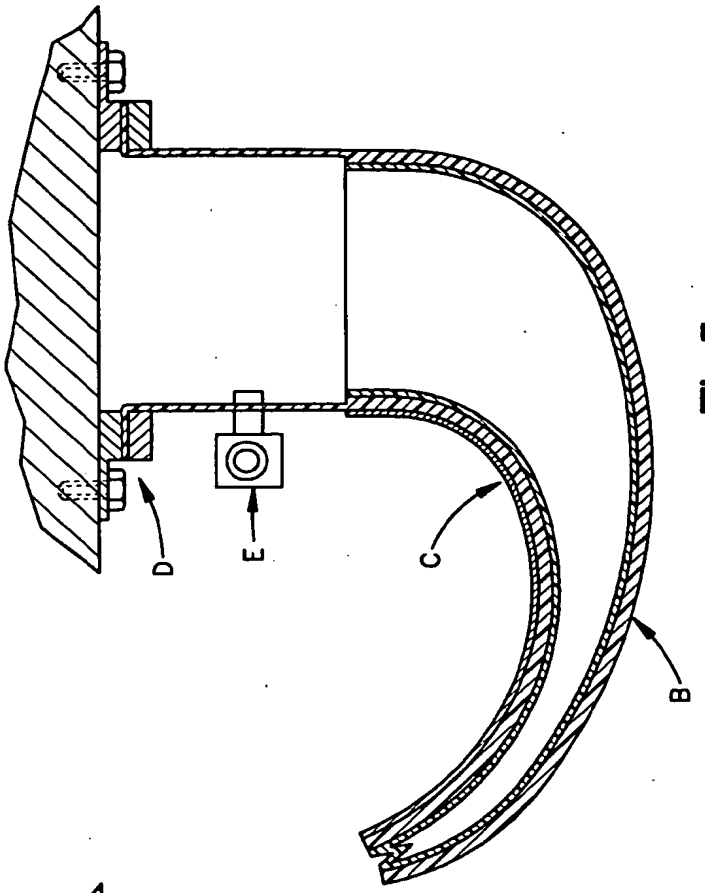

Fig.5

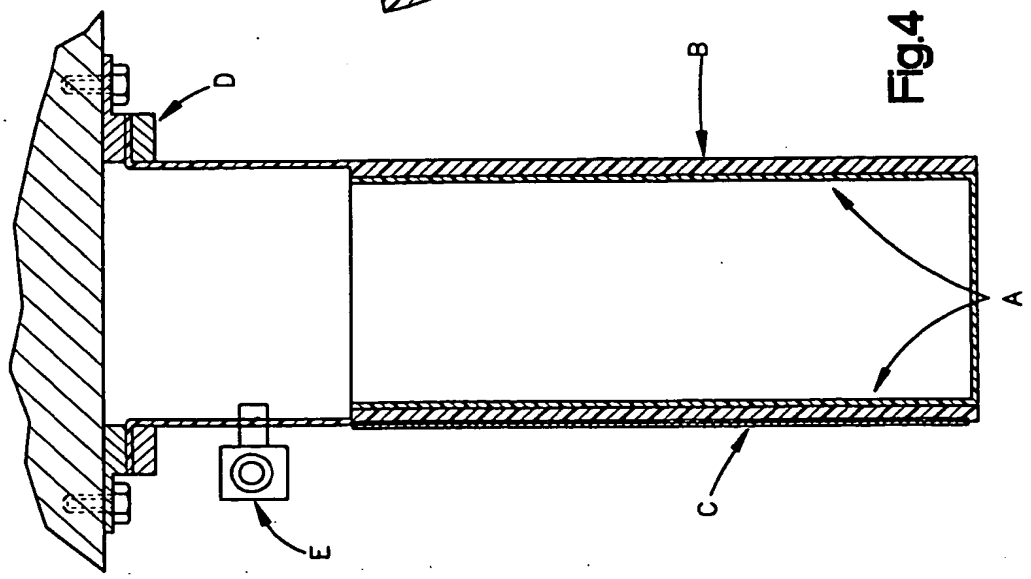

Fig.4

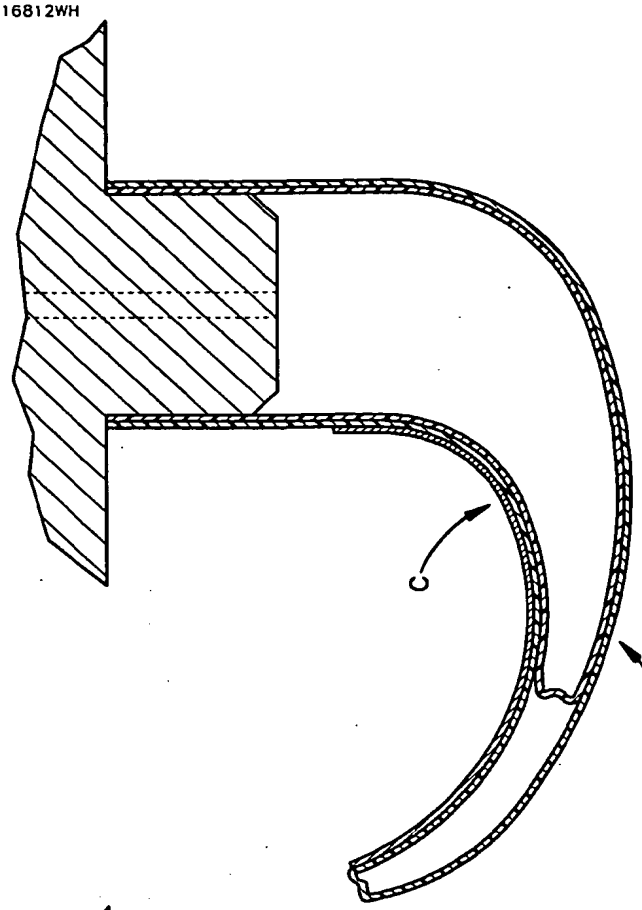

Fig.7

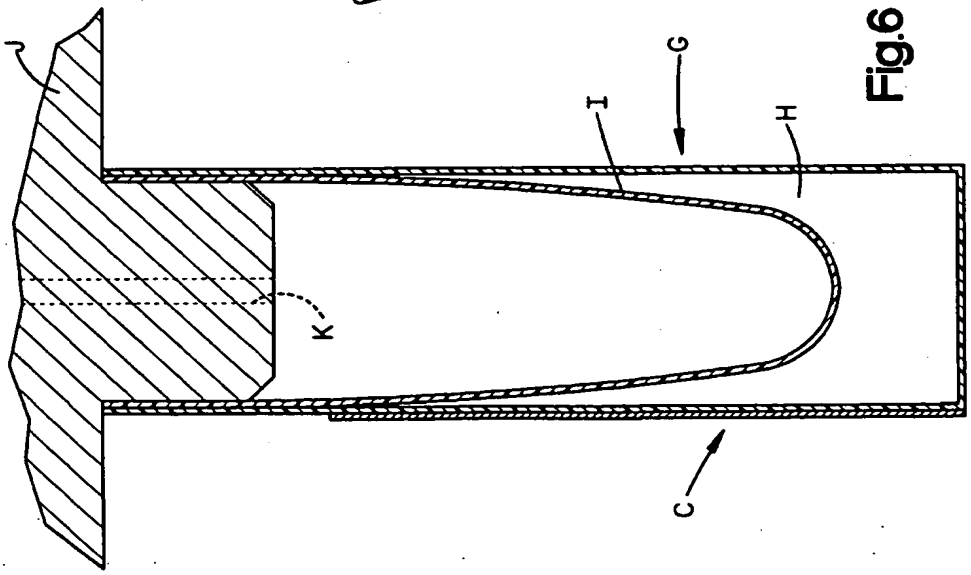

Fig.6

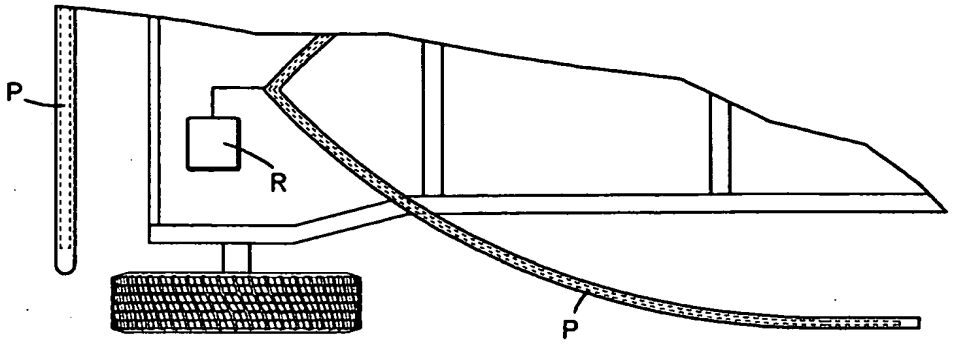

Fig.8

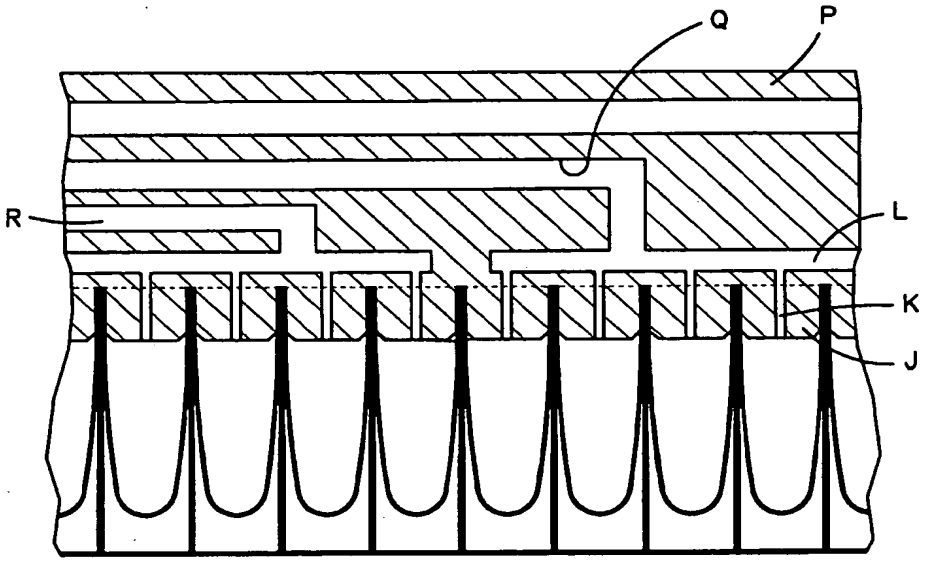

Fig.9

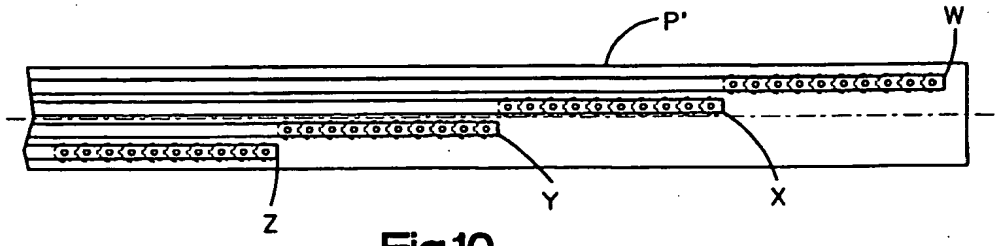

Fig.10

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

HINTON, Jennifer, Nock
Watts Hoffmann Co., L.P.A.
P.O. Box 99839
Cleveland, OH 44199-0839
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 01 August 2006 (01.08.2006)	
Applicant's or agent's file reference 16-812PCT	IMPORTANT NOTIFICATION
International application No. PCT/US2006/014906	International filing date *(day/month/year)* 20 April 2006 (20.04.2006)
International publication date *(day/month/year)* **Not yet published**	Priority date *(day/month/year)* 21 April 2005 (21.04.2005)
Applicant DAYTON, Roderick	

1. By means of this Form, which replaces any previously issued notification concerning submission or transmittal of priority documents, the applicant is hereby notified of the date of receipt by the International Bureau of the priority document(s) relating to all earlier application(s) whose priority is claimed. Unless otherwise indicated by the letters "NR", in the right-hand column or by an asterisk appearing next to a date of receipt, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).

2. *(If applicable)* The **letters "NR"** appearing in the right-hand column denote **a priority document which, on the date of mailing of this Form, had not yet been received by the International Bureau** under Rule 17.1(a) or (b). Where, under Rule 17.1(a), the priority document must be submitted by the applicant to the receiving Office or the International Bureau, but the applicant fails to submit the priority document within the applicable time limit under that Rule, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

3. *(If applicable)***An asterisk (*)** appearing next to a date of receipt, in the right-hand column, denotes **a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b)** (the priority document was received after the time limit prescribed in Rule 17.1(a) or the request to prepare and transmit the priority document was submitted to the receiving Office after the applicable time limit under Rule 17.1(b)). Even though the priority document was not furnished in compliance with Rule 17.1(a) or (b), the International Bureau will nevertheless transmit a copy of the document to the designated Offices, for their consideration. In case such a copy is not accepted by the designated Office as the priority document, Rule 17.1(c) provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

Priority date	Priority application No.	Country or regional Office or PCT receiving Office	Date of receipt of priority document
21 April 2005 (21.04.2005)	60/673,506	US	19 June 2006 (19.06.2006)
26 January 2006 (26.01.2006)	60/762,329	US	13 June 2006 (13.06.2006)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer
Beate Giffo-Schmitt
Facsimile No. +41 22 338 87 20
Telephone No. +41 22 338 92 41